Met Office

NEWS

£11m programme to improve extreme weather forecasting

Author: Press Office
13:00 (UTC+1) on Thu 1 Jun 2023

A joint Met Office and Natural Environment Research Council research programme aims to improve forecasting of extreme weather, helping the UK better manage weather related risk.

The frequency and intensity of extreme weather in the UK is expected to increase as a consequence of human induced climate change, so it is becoming ever more important to accurately forecast severe weather events that can harm people, their livelihoods, and damage infrastructure.

Whether it's forecasts for the next few days, or projections for the coming decades, meteorology and climate science depend on models which simulate, one-step at a time, how the atmosphere will evolve. Numerical weather prediction models work by splitting the atmosphere into boxes from the surface all the way up to 70km above the earth. By using observations as a starting point, the complex computer models project how the atmosphere will change over time. These outputs are often run a number of times with slightly different starting conditions to provide what is known as an ensemble. These ensembles provide an assessment of certainty in the model output depending on how similar, or how different, the resulting forecast is.

Increasing resolution

By looking at smaller and smaller boxes the model creates higher resolution output which gives better representation of the surface terrain and simultaneously captures cloud-scale motions and long-range atmospheric flows. This new research aims to improve how models represent thermals, and other turbulent motions, in the atmosphere.

Five new projects have been selected by NERC to work with Met Office scientists on improving these models, including researchers from the Universities of Exeter, Leeds, Reading, Imperial College, Manchester and the UK Centre for Ecology and Hydrology.

Collectively the projects will:

- Carry out observations of atmospheric turbulence using radar, cameras, drones and aircraft measurements
- Study how atmospheric turbulence is represented in computer models
- Improve the physics and mathematics used in more detailed (higher resolution) computer models
- Study how to model the chaotic nature of atmospheric turbulence
- Improve the modelling of processes that produce thunderstorms and heavy rain

Working in partnership

Stephen Belcher, Chief of Science and Technology at the Met Office said: “As our climate changes and we see more frequent spells of severe weather, it is crucial that we constantly evolve and innovate to provide the most accurate forecasts and climate projections possible. Providing better forecasts that help the UK to build in resilience to our evolving climate is a priority for the Met Office. The science of representing turbulence in our weather and climate models is a fundamental and exciting challenge, it is fantastic to form a partnership with NERC to make progress in this area.”

Duncan Wingham, Executive Chair of NERC, said: “Extreme weather is becoming more common due to the effects of climate change. Predicting both the scale and location of these events is a key challenge as they increasingly impact lives, homes and infrastructure.

“We are investing in programmes that improve our understanding of the atmospheric turbulence, so we can strengthen our monitoring and modelling tools.”

Science in the sky

These projects will link closely with the Met Office’s Wessex Convection Experiment (WesCon), which will collect observations of convective clouds to better understand how they form and develop, leading to heavy rainfall and thunderstorms. WesCon’s airborne science campaign will deploy the FAAM Airborne Laboratory’s research aircraft to look specifically at convective clouds, and how updrafts and turbulence interact with other storm development processes.

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